

Analytical Data Package Prepared For

CH2M Hill Plateau Remediation

Radiochemical Analysis By
TestAmerica Inc

2800 G.W. Way, Richland Wa, 99354, (509)-375-3131.

Assigned Laboratory Code: TARL
Data Package Contains 14 Pages

Report No.: 72573

Results in this report relate only to the sample(s) analyzed.

SDG No.	Order No.	Client Sample ID (List Order)	Lot-Sa No.	Work Order	Report DB ID	Batch No.
W08033	F18-009	B3HY96	J8C190402-1	NAPF82AA	9NAPF820	8078043
		B3HY96	J8C190402-1	NAPF81AC	9NAPF810	8078044



Certificate of Analysis

CH2M Hill Plateau Remediation Company
P.O. Box 1600
Mail Stop – R3-60
Richland, WA 99352

April 4, 2018

Attention: Scot Fitzgerald

SAF Number	:	F18-009
Date SDG Closed	:	March 15, 2018
Number of Samples	:	One (1)
Sample Type	:	Water
SDG Number	:	W08033
Data Deliverable	:	30-Day / Summary

CASE NARRATIVE

I. Introduction

On March 15, 2018 one sample was received at TestAmerica (TARL). Upon receipt, the sample was assigned a laboratory ID number to correspond with the CH2M specific ID.

II. Sample Receipt

The sample was received in good condition and no anomalies were noted during check-in.

III. Analytical Results/Methodology

The analytical results for this report are presented by laboratory sample ID. Each set of data includes sample identification information, analytical results and the appropriate associated statistical errors.

The requested analyses were:

Gas Proportional Counting

Gross Alpha by method RL-GPC-001

Gross Beta by method RL-GPC-001

CH2M Hill Plateau Remediation Company
April 4, 2018

IV. Quality Control

The analytical results for each analysis performed includes a minimum of one laboratory control sample (LCS), one method (reagent) blank, and one duplicate sample analysis. Any exceptions have been noted in the "Comments" section. QC and sample results are reported in the same units.

V. Comments

Gas Proportional Counting

Gross Alpha by method RL-GPC-001:


No analytical or quality issues were noted. The sample result and associated batch QC results are within contractual requirements.

Gross Beta by method RL-GPC-001:

No analytical or quality issues were noted. The sample result and associated batch QC results are within contractual requirements.

We certify that this data package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

Reviewed and approved:

 Digitally signed by
Ashley L. Worthy
Date: 2018.04.04
14:11:45 -07'00'

Ashley L. Worthy
Project Manager

Drinking Water Method Cross References

DRINKING WATER ASTM METHOD CROSS REFERENCES		
Referenced Method	Isotope(s)	TestAmerica Richland's SOP No.
EPA 901.1	Cs-134, I-131	RL-GAM-001
EPA 900.0	Alpha & Beta	RL-GPC-001
EPA 00-02	Gross Alpha (Coprecipitation)	RL-GPC-002
EPA 903.0	Total Alpha Radium (Ra-226)	RL-RA-002
EPA 903.1	Ra-226	RL-RA-001
EPA 904.0	Ra-228	RL-RA-001
EPA 905.0	Sr-89/90	RL-GPC-003
ASTM D5174	Uranium	RL-KPA-003
EPA 906.0	Tritium	RL-LSC-005

Results in this report relate only to the sample(s) analyzed.

Uncertainty Estimation

TestAmerica Richland has adopted the internationally accepted approach to estimating uncertainties described in "NIST Technical Note 1297, 1994 Edition". The approach, "Law of Propagation of Errors", involves the identification of all variables in an analytical method which are used to derive a result. These variables are related to the analytical result (R) by some functional relationship, $R = \text{constants} * f(x,y,z,...)$. The components (x,y,z) are evaluated to determine their contribution to the overall method uncertainty. The individual component uncertainties (u_i) are then combined using a statistical model that provides the most probable overall uncertainty value. All component uncertainties are categorized as type A, evaluated by statistical methods, or type B, evaluated by other means. Uncertainties not included in the components, such as sample homogeneity, are combined with the component uncertainty as the square root of the sum-of-the-squares of the individual uncertainties. The uncertainty associated with the derived result is the combined uncertainty (u_c) multiplied by the coverage factor (1,2, or 3).

When three or more sample replicates are used to derive the analytical result, the type A uncertainty is the standard deviation of the mean value (S/\sqrt{n}), where S is the standard deviation of the derived results. The type B uncertainties are all other random or non-random components that are not included in the standard deviation.

The derivation of the general "Law of Propagation of Errors" equations and specific example are available on request.

Report Definitions

Action Lev	An agreed upon activity level used to trigger some action when the final result is greater than or equal to the Action Level. Often the Action Level is related to the Decision Limit.
Batch	The QC preparation batch number that relates laboratory samples to QC samples that were prepared and analyzed together.
Bias	Defined by the equation (Result/Expected)-1 as defined by ANSI N13.30.
COC No	Chain of Custody Number assigned by the Client or TestAmerica.
Count Error (#s)	Poisson counting statistics of the gross sample count and background. The uncertainty is absolute and in the same units as the result. For Liquid Scintillation Counting (LSC) the batch blank count is the background.
CSU (#s) <i>u_c Combined Standard Uncert.</i>	All known uncertainties associated with the preparation and analysis of the sample are propagated to give a measure of the uncertainty associated with the result, <i>u_c the combined standard uncertainty</i> . The uncertainty is absolute and in the same units as the result.
(#s), Coverage Factor CRDL (RL)	The coverage factor defines the width of the confidence interval, 1, 2 or 3 standard deviations. Contractual Required Detection Limit as defined in the Client's Statement Of Work or TestAmerica "default" nominal detection limit. Often referred to the reporting level (RL)
Lc	Decision Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume associated with the sample. The Type I error probability is approximately 5%. $Lc = (1.645 * \sqrt{2 * (BkgrndCnt / BkgrndCntMin) / SCntMin}) * (ConvFct / (Eff * Yld * Abn * Vol) * IngrFct)$. For LSC methods the batch blank is used as a measure of the background variability. Lc cannot be calculated when the background count is zero.
Lot-Sample No	The number assigned by the LIMS software to track samples received on the same day for a given client. The sample number is a sequential number assigned to each sample in the Lot.
MDC MDA MDL	Detection Level based on instrument background or blank, adjusted by the Efficiency, Chemical Yield, and Volume with a Type I and II error probability of approximately 5%. $MDC = (4.65 * \sqrt{(BkgrndCnt / BkgrndCntMin) / SCntMin}) + 2.71 / SCntMin * (ConvFct / (Eff * Yld * Abn * Vol) * IngrFct)$. For LSC methods the batch blank is used as a measure of the background variability.
Primary Detector	The instrument identifier associated with the analysis of the sample aliquot.
Ratio U-234/U-238	The U-234 result divided by the U-238 result. The U-234/U-238 ratio for natural uranium in NIST SRM 4321C is 1.038.
Rst/MDC	Ratio of the Result to the MDC. A value greater than 1 may indicate activity above background at a high level of confidence. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Rst/TotUcert	Ratio of the Result to the Total Uncertainty. If the uncertainty has a coverage factor of 2 a value greater than 1 may indicate activity above background at approximately the 95% level of confidence assuming a two-sided confidence interval. Caution should be used when applying this factor and it should be used in concert with the qualifiers associated with the result.
Report DB No	Sample Identifier used by the report system. The number is based upon the first five digits of the Work Order Number.
RER	The equation Replicate Error Ratio = $(S - D) / [\sqrt{TPUs^2 + TPUd^2}]$ as defined by ICPT BOA where S is the original sample result, D is the result of the duplicate, TPUs is the total uncertainty of the original sample and TPUd is the total uncertainty of the duplicate sample.
SDG	Sample Delivery Group Number assigned by the Client or assigned by TestAmerica upon sample receipt.
Sum Rpt Alpha Spec Rst(s)	The sum of the reported alpha spec results for tests derived from the same sample excluding duplicate result where the results are in the same units.
Work Order	The LIMS software assign test specific identifier.
Yield	The recovery of the tracer added to the sample such as Pu-242 used to trace a Pu-239/40 method.

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F18-009-016	PAGE 1 OF 1
COLLECTOR Frank Hall /CHPRC	COMPANY CONTACT MEDLEY, HA	TELEPHONE NO. 373-6909	PROJECT COORDINATOR MEDLEY, HA		REQUIRED TAT 30 Days ORIGINAL	
SAMPLING LOCATION TEDF Generator - 283-W (SL-47-P-04)	PROJECT DESIGNATION TEDF Generator Expanded Sampling		SAF NO. F18-009			
ICE CHEST NO. N/A	FIELD LOGBOOK NO. HNF-N- 507-39	ACTUAL SAMPLE DEPTH N/A	PURCHASE ORDER/CHARGE CODE 301754		METHOD OF SHIPMENT GOVERNMENT VEHICLE	
SHIPPED TO TestAmerica Incorporated, Richland	OFFSITE PROPERTY NO. N/A		BILL OF LADING/AIR BILL NO. N/A			

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION	HNO3 to pH <2
		HOLDING TIME	6 Months
		TYPE OF CONTAINER	P
		NO. OF CONTAINER(S)	1
		VOLUME	1L
SPECIAL HANDLING AND/OR STORAGE N/A		SAMPLE ANALYSIS	9310_ALPHABE TA_GPC: COMMON {Gross alpha, Gross beta};

SAMPLE NO.	FILTERED	MATRIX*	SAMPLE DATE	SAMPLE TIME
B38Y96	N/A	WATER	MAR 15 2018	1110

J8C190402
W08033

04/04/2018

CHAIN OF POSSESSION RELINQUISHED BY/REMOVED FROM		SIGN/ PRINT NAMES RECEIVED BY/STORED IN		SPECIAL INSTRUCTIONS	
Frank Hall /CHPRC MAR 15 2018 1140		Troy Bacon CHPRC MAR 15 2018 1140		TRVL-18-091; Samplers are to obtain field data from the generator: Flow: N/A pH: 5.67 conductivity: 252.7 283-W Water Treatment Plant POC is Sam Camp, 373-5824	
Troy Bacon CHPRC MAR 15 2018 1230		Tim Callaway /CHPRC MAR 15 2018 1230			
Tim Callaway /CHPRC MAR 15 2018 1455		Tina R Holm TARL MAR 15 2018 1455			
FINAL SAMPLE DISPOSITION		DISPOSAL METHOD		DISPOSED BY	
				DATE/TIME	

PRINTED ON 2/28/2018

FSR ID = FSR58310

TRVL NUM = TRVL-18-091

A-6003-618 (REV 3)

REV.0

THE LEADER IN ENVIRONMENTAL TESTING

Date/Time Received: 3-15-18 / 1455

Container GM Screen Result: (Airlock) 0 cpm Initials BJ

Sample GM Screen Result (Sample Receiving) 0 cpm Initials BJ

Container Alpha Screen Result: (Airlock) 0 cpm Initials BJ

Sample Alpha Screen Result (Sample Receiving) 0 cpm Initials BJ

Client: FLH

SDG #: W08033

SAF #: F18-009

NA []

Lot Number: J8C9040

Chain of Custody # F18-009-016

Shipping Container ID or Air Bill Number : NA BJ

Samples received inside shipping container/cooler/box

Yes BJ Continue with 1 through 4. Initial appropriate response.

No [] Go to 5, add comment to #16.

1. Custody Seals on shipping container intact? Yes [] No [] No Custody Seal BJ
2. Custody Seals dated and signed? Yes [] No [] No Custody Seal BJ
3. Cooler temperature: 4.0 °C ICE NA []
4. Vermiculite/packing materials is NA [] Wet [] Dry []

Item 5 through 16 for samples. Initial appropriate response.

5. Chain of Custody record present? Yes BJ No []
6. Number of samples received (Each sample may contain multiple bottles): 1
7. Containers received: 1 x LP

8. Sample holding times exceeded? NA [] Yes [] No BJ
9. Samples have: tape hazard labels BJ custody seals BJ appropriate sample labels
10. Matrix: A (FLT, Wipe, Solid, Soil) BJ I (Water) S (Air, Niosh 7400) T (Biological, Ni-63)
11. Samples: BJ are in good condition are leaking are broken
have air bubbles (Only for samples requiring no head space) Other
12. Sample pH appropriate for analysis requested Yes BJ No [] NA []
(If acidification is necessary go to pH area & document sample ID, initial pH, amount of HNO₃ added and pH after addition on table)
13. Were any anomalies identified in sample receipt? Yes [] No BJ
14. Description of anomalies (include sample numbers): NA BJ
15. Sample Location, Sample Collector Listed on COC? * Yes BJ No []
*For documentation only. No corrective action needed.
16. Additional Information: N/A

[] Client/Courier denied temperature check.

BJ Client/Courier unpack cooler.

Sample Check-in List completed by Sample Custodian:

Signature: BJ

Date: 3-15-18

Client Notification needed? Yes [] No [] Date:

By:

Person contacted:

[X] No action necessary; process as is

Project Manager

C. L. H. W.

Date

3-19-18

04/04/2018

REV.0

Sample Results Summary

Date: 04-Apr-18

TestAmerica Inc TARL

Ordered by Method, Batch No., Client Sample ID.

Report No. : 72573

SDG No: W08032

Client Id		Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	MDL	CRDL	RPD
Batch	Work Order								
8078043	9310_ALPHABETA_GPC								
	B3HY86 DUP								
	NAPF42AD	Alpha	3.95E-01 +- 5.0E-01	U	pCi/L	100%	8.16E-01	3.00E+00	72.1
	B3HY96								
	NAPF82AA	Alpha	1.38E-01 +- 5.3E-01	U	pCi/L	100%	9.37E-01	3.00E+00	
8078044	9310_ALPHABETA_GPC								
	B3HY91 DUP								
	NAPF51AD	Beta	2.05E+00 +- 1.3E+00		pCi/L	100%	1.94E+00	4.00E+00	24.7
	B3HY96								
	NAPF81AC	Beta	6.96E-01 +- 1.1E+00	U	pCi/L	100%	1.84E+00	4.00E+00	
No. of Results: 4									

04/04/2018

REV.0

QC Results Summary
TestAmerica Inc TARL
Ordered by Method, Batch No, QC Type,.

Date: 04-Apr-18

Report No. : 72573

SDG No.: W08032

Batch	Work Order	Parameter	Result +- CSU (2 s)	Qual	Units	Tracer Yield	LCS Recovery	Bias	MDL
9310_ALPHABETA_GPC									
8078043	BLANK QC,								
	NAPHF2AA	Alpha	2.32E-01 +- 3.4E-01	U	pCi/L	100%			5.75E-01
8078043	LCS,								
	NAPHF2AC	Alpha	1.86E+01 +- 4.8E+00		pCi/L	100%	83%	-0.2	6.66E-01
9310_ALPHABETA_GPC									
8078044	BLANK QC,								
	NAPHG1AA	Beta	5.00E-01 +- 1.1E+00	U	pCi/L	100%			1.79E+00
8078044	LCS,								
	NAPHG1AC	Beta	2.34E+01 +- 3.4E+00		pCi/L	100%	105%	0.0	1.90E+00
No. of Results: 4									

FORM I

Date: 04-Apr-18

SAMPLE RESULTS

Lab Name: TestAmerica Inc

SDG: W08033

Collection Date: 3/15/2018 11:10:00 AM

Lot-Sample No.: J8C190402-1

Report No.: 72573

Received Date: 3/15/2018 2:55:00 PM

Client Sample ID: B3HY96

COC No.: F18-009-016

Matrix: WATER

Ordered by Client Sample ID, Batch No.

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, Lc	Yield CRDL(RL)	Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8078043 9310_ALPHABETA_GPC												
				Work Order: NAPF82AA Report DB ID: 9NAPF820								
Alpha	1.38E-01	U	5.3E-01	5.3E-01	9.37E-01	pCi/L	100%	0.15	4/2/18 11:37 a		0.20126	GPC24A
						4.17E-01	3.00E+00	0.52			L	
Batch: 8078044 9310_ALPHABETA_GPC												
				Work Order: NAPF81AC Report DB ID: 9NAPF810								
Beta	6.96E-01	U	1.1E+00	1.1E+00	1.84E+00	pCi/L	100%	0.38	3/28/18 04:09 p		0.201	GPC27A
						8.84E-01	4.00E+00	(1.3)			L	

No. of Results: 2 Comments:

04/04/2018

REV.0

TestAmerica Inc MDC|MDA,Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.
rptSTLrchSample U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.
V5.8.5 A2002

FORM II

Date: 04-Apr-18

DUPLICATE RESULTS

Lab Name: TestAmerica Inc

SDG: W08032

Collection Date: 3/15/2018 12:20:00 PM

Lot-Sample No.: J8C190401-1

Report No. : 72573

Received Date: 3/15/2018 2:55:00 PM

Client Sample ID: B3HY86 DUP

COC No. : F18-009-006

Matrix: WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8078043	9310_ALPHABETA_GPC											
Alpha	3.95E-01	U	4.9E-01	5.0E-01	8.16E-01	pCi/L	100%	0.48	4/2/18 11:37 a		0.2006	GPC23C
	8.40E-01	U	RPD 72.1			3.00E+00		(1.6)	Orig Sa DB ID: 9NAPF420		L	

No. of Results: 1 Comments:

04/04/2018

REV.0

TestAmerica Inc RPD - Relative Percent Difference.

rptSTLRchDupV5.

MDC(MDA)Lc - Detection, Decision Level based on instrument background or blank, adjusted by the sample Efficiency, Yield, and Volume.

8.5 A2002

U Qual - Analyzed for but not detected above limiting criteria, Mdc/Mda/Mdl, Total Uncert, RDL or not identified by gamma scan software.

FORM II

Date: 04-Apr-18

DUPLICATE RESULTS

Lab Name: TestAmerica Inc

SDG: W08032

Collection Date: 3/15/2018 1:25:00 PM

Lot-Sample No.: J8C190401-2

Report No. : 72573

Received Date: 3/15/2018 2:55:00 PM

Client Sample ID: B3HY91 DUP

COC No. : F18-009-011

Matrix: WATER

Parameter	Result, Orig Rst	Qual	Count Error (2 s)	CSU (2 s)	MDL, Action Lev	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8078044	9310_ALPHABETA_GPC				NAPF51AD	Report DB ID: NAPF51DR			Orig Sa DB ID: 9NAPF510			
Beta	2.05E+00		1.2E+00	1.3E+00	1.94E+00	pCi/L	100%	(1.1)	3/28/18 04:09 p		0.20103	GPC26D
	2.62E+00		RPD 24.7			4.00E+00		(3.3)			L	

No. of Results: 1 Comments:

04/04/2018

REV.0

FORM II BLANK RESULTS

Date: 04-Apr-18

Lab Name: TestAmerica Inc
Matrix: WATER

SDG: W08032
Report No.: 72573

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL, Lc	Rpt Unit, CRDL	Yield	Rst/MDL, Rst/TotUcert	Analysis, Prep Date	Total Sa Size	Aliquot Size	Primary Detector
Batch: 8078043 9310_ALPHABETA_GPC												
Alpha	2.32E-01	U	3.4E-01	3.4E-01	5.75E-01	pCi/L	100%	0.4	4/2/18 11:37 a		0.20004	GPC24B
					2.44E-01	3.00E+00		(1.4)			L	
Batch: 8078044 9310_ALPHABETA_GPC												
Beta	5.00E-01	U	1.1E+00	1.1E+00	1.79E+00	pCi/L	100%	0.28	3/28/18 04:09 p		0.20043	GPC27B
					8.58E-01	4.00E+00		0.94			L	

No. of Results: 2 Comments:

04/04/2018

REV.0

FORM II
LCS RESULTS

Date: 04-Apr-18

Lab Name: TestAmerica Inc

SDG: W08032

Matrix: WATER

Report No. : 72573

Parameter	Result	Qual	Count Error (2 s)	CSU (2 s)	MDL	Report Unit	Yield	Expected	Expected Uncert	Recovery, Bias	Analysis, Prep Date	Aliquot Size	Primary Detector
Batch: 8078043 9310_ALPHABETA_GPC													
Alpha	1.86E+01		1.5E+00	4.8E+00	6.66E-01	pCi/L	100%	2.24E+01	2.2E-01	83%	4/2/18 11:37 a	0.20018	GPC24C
							Rec Limits:	80	120	-0.2			
Batch: 8078044 9310_ALPHABETA_GPC													
Beta	2.34E+01		1.9E+00	3.4E+00	1.90E+00	pCi/L	100%	2.23E+01	1.6E-01	105%	3/28/18 04:09 p	0.2028	GPC27C
							Rec Limits:	80	120	0.0			

No. of Results: 2 Comments:

04/04/2018

REV.0